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ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

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AGARD BULLETIN TECHNICAL PROGRAM 1978

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THE MISSION OF AGARD

The mission of AGARD is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace for the following purposes:

- Exchanging of scientific and technical information;
- Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;
- Improving the co-operation among member nations in aerospace research and development;
- Providing scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development;
- Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field;
- Providing assistance to member nations for the purpose of increasing their scientific and technical potential;
- Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community.

The highest authority within AGARD is the National Delegates Board consisting of officially appointed senior representatives from each member nation. The mission of AGARD is carried out through the Panels which are composed of experts appointed by the National Delegates, the Consultant and Exchange Program and the Aerospace Applications Studies Program. The results of AGARD work are reported to the member nations and the NATO Authorities through the AGARD series of publications of which this is one.

Participation in AGARD activities is by invitation only and is normally limited to citizens of the NATO nations.

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PREFACE

→ In March 1977, the AGARD National Delegates Board convened in Paris under the chairmanship of Mr Frank R. Thurston to review and approve the AGARD Technical Program and Budget for 1978. Details of this proposed Technical Program were presented to the National Delegates Board by the respective Panel Chairmen, the Chairman of the Aerospace Applications Studies Committee and AGARD Staff Officers, following which an overview of the 1978 Proposed Program and Budget was presented.

→ This report reflects the Program that was approved by the AGARD National Delegates Board. Section I includes a chronological listing of the meetings tentatively scheduled to take place during 1978 and Section II gives a detailed description of the individual Panel Programs, the Consultant and Exchange Program, and the Military Committee Studies Program. The total budget required to support the Proposed 1978 AGARD Technical Program is presented in Section III. The Publication Summary in Section IV identifies by activity the AGARD publications scheduled for initiation and/or publication in 1978.

Robert H. Korke

Robert H. Korke
Director

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I – CALENDAR OF PLANNED MEETINGS – 1978**Traduction des Titres des Réunions**

**CALENDAR OF PLANNED MEETINGS
1978**

<i>Tentative Dates</i>	<i>Location</i>	<i>Panel</i>	<i>Type of Meeting/Subject</i>
20-24 February	BELGIUM	Fluid Dynamics/VKI	Lecture Series No.94 Three Dimensional and Unsteady Separation at High Reynolds Numbers
15-17 March	FRANCE (Paris)	Headquarters	44th National Delegates Board Meeting 24th Panel Chairmen Meeting 25th Steering Committee Meeting 8th National Coordinators Meeting
3-7 April	UNITED KINGDOM	Propulsion & Energetics	51st Panel Meeting/Specialists' Meetings - Icing Testing for Aircraft Engines - Seal Technology in Gas Turbine Engines
10-14 April	DENMARK	Structures & Materials	46th Panel Meeting/Specialists' Meeting Characterization of Low Cycle High Temperature Fatigue by the Strainrange Partitioning Method
17-18 April	NETHERLANDS	Technical Information	Lecture Series No.92 The Application of Inexpensive Minicomputers to Information Work
20-21 April	TURKEY	Technical Information	Lecture Series No.92 The Application of Inexpensive Minicomputers to Information Work
24-28 April	CANADA	Electromagnetic Wave Propagation	Symposium Operational Modeling of the Aerospace Propagation Environment
24-28 April	BELGIUM	Flight Mechanics	52nd Panel Meeting/Specialists' Meeting Piloted Aircraft Environment Simulation Techniques
1-5 May	UNITED STATES	Aerospace Medical	Specialists' Meeting Operational Helicopter Aviation Medicine
8-12 May	NORWAY	Guidance & Control	26th Panel Meeting/Symposium The Impact of Integrated Guidance and Control Technology on Weapons Systems Design (Classified)
8-9 May	NORWAY	Electromagnetic Wave Propagation	Lecture Series No.93 Recent Advances in Radio and Optical Propagation for Modern Communications, Navigation and Detection Systems
11-12 May	UNITED KINGDOM	Electromagnetic Wave Propagation	Lecture Series No.93 Recent Advances in Radio and Optical Propagation for Modern Communications, Navigation and Detection Systems
15-16 May	ITALY	Electromagnetic Wave Propagation	Lecture Series No.93 Recent Advances in Radio and Optical Propagation for Modern Communications, Navigation and Detection Systems
15-24 May	UNITED STATES	Aerospace Applications Studies Committee	AASC Meeting No.15 and Working Groups (Classified)
29 May-1 June	GREECE	Fluid Dynamics	42nd Panel Meeting/Symposium Dynamic Stability Parameters

<i>Tentative Dates</i>	<i>Location</i>	<i>Panel</i>	<i>Type of Meeting/Subject</i>
5-9 June	GERMANY	Avionics	35th Panel Meeting/Symposium Digital Communications in Avionics
6-7 June	UNITED KINGDOM	Guidance & Control	Lecture Series No.95 Strap-Down Inertial Systems
12-13 June	NORWAY	Guidance & Control	Lecture Series No.95 Strap-Down Inertial Systems
15-16 June	GERMANY	Guidance & Control	Lecture Series No.95 Strap-down Inertial Systems
19-20 June	ITALY	Guidance & Control	Lecture Series No.95 Strap-Down Inertial Systems
4-8 September	GERMANY	Electromagnetic Wave Propagation	25th Panel Meeting/Symposium Millimeter and Sub-Millimeter Wave Propagation and Circuits
18-20 September	PORTUGAL (Lisbon)	Headquarters	14th Annual Meeting 45th National Delegates Board Meeting 25th Panel Chairmen Meeting
25-29 September	ITALY	Structures & Materials	47th Panel Meeting/Specialists Meeting Advanced Fabrication Processes
25-29 September	CANADA	Flight Mechanics	53rd Panel Meeting/Symposium Stability and Control
2-6 October	NORWAY	Fluid Dynamics	43rd Panel Meeting/Symposium High Angle of Attack Aerodynamics
2-3 October	GERMANY	Structures & Materials	Lecture Series No.97 Fracture Mechanics Design Methodology
5-6 October	NETHERLANDS	Structures & Materials	Lecture Series No.97 Fracture Mechanics Design Methodology
9-10 October	PORTUGAL	Structures & Materials	Lecture Series No.97 Fracture Mechanics Design Methodology
9-13 October	NETHERLANDS	Guidance & Control	27th Panel Meeting/Symposium The Guidance and Control of Helicopters and V/STOL Aircraft at Night and in Poor Visibility (Classified)
16-21 October	UNITED STATES	Avionics	36th Panel Meeting/Symposium Data Handling Techniques and Systems Specialists' Meeting Strategies for Automatic Track Initiation
16-20 October	FRANCE	Technical Information	31st Panel Meeting/Specialists' Meeting Information and Industry
23-24 October	UNITED KINGDOM	Propulsion & Energetics	Lecture Series No.96 Energy Conservation in Aircraft Propulsion
26-27 October	GERMANY	Propulsion & Energetics	Lecture Series No.96 Energy Conservation in Aircraft Propulsion
23-27 October	UNITED STATES	Propulsion & Energetics	52nd Panel Meeting/Symposium Stresses, Vibrations, Structural Integration and Engine Integrity (Including Aeroelasticity and Flutter)

<i>Tentative Dates</i>	<i>Location</i>	<i>Panel</i>	<i>Type of Meeting/Subject</i>
6-10 November	FRANCE	Aerospace Medical	35th Panel Meeting/Specialists' Meetings - Human Biodynamic Response and use of Analogues and Models for Evaluation of Escape/Crash Injuries and Protection - Human Factors Aspects of Aircraft Accidents and Incidents - Recent Advances in Aeronautical and Space Medicine
6-15 November	BELGIUM	Aerospace Applications Studies Committee	AASC Meeting No.16 and Working Groups (Classified)

TRADUCTION DES TITRES DES REUNIONS

<i>Titles of Meetings</i>	<i>Titres des Réunions</i>
	Aerospace Medical Panel
<ul style="list-style-type: none"> – Operational helicopter aviation medicine – Human biodynamic response and use of analogues and models for evaluation of escape/crash injuries and protection – Human factors aspects of aircraft accidents and incidents – Recent advances in aeronautical and space medicine 	<ul style="list-style-type: none"> – La médecine aéronautique dans le domaine des opérations héliportées – La réponse humaine biodynamique et l'emploi des représentations analogiques et des modèles pour évaluer les lésions occasionnées par les atterrissages accidentels et les évacuations d'avions en vol, ainsi que les mesures de protection correspondantes – Accidents et incidents d'avions considérés sous l'angle des facteurs humains – Progrès récents en médecine spatiale
	Avionics Panel
<ul style="list-style-type: none"> – Digital communications in avionics – Data handling techniques and systems – Strategies for automatic track initiation 	<ul style="list-style-type: none"> – Communications numériques en électronique aérospatiale – Techniques et systèmes de traitement de données – Stratégies de déclenchement automatique de poursuite
	Electromagnetic Wave Propagation Panel
<ul style="list-style-type: none"> – Operational modeling of the aerospace propagation environment – Millimeter and sub-millimeter wave propagation and circuits 	<ul style="list-style-type: none"> – Modélisation, basée sur des données opérationnelles, de l'environnement de propagation aérospatial – Propagation et circuits d'ondes millimétriques et sous-millimétriques
	Flight Mechanics Panel
<ul style="list-style-type: none"> – Piloted aircraft environment simulation techniques – Stability and control 	<ul style="list-style-type: none"> – Techniques de simulation de l'environnement des avions pilotés – Stabilité et contrôle
	Fluid Dynamics Panel
<ul style="list-style-type: none"> – Dynamic stability parameters – High angle of attack aerodynamics 	<ul style="list-style-type: none"> – Paramètres de stabilité dynamique – L'aérodynamique aux angles d'attaque prononcés
	Guidance & Control Panel
<ul style="list-style-type: none"> – The impact of integrated guidance and control technology on weapons systems design – The guidance and control of helicopters and V/STOL aircraft at night and in poor visibility 	<ul style="list-style-type: none"> – Impact du guidage et du contrôle intégrés sur la conception des systèmes d'armes – Guidage et contrôle nocturnes et par mauvaise visibilité des hélicoptères et des avions ADAC/ADAV
	Propulsion & Energetics Panel
<ul style="list-style-type: none"> – Icing testing for aircraft engines – Seal Technology in gas turbine engines – Stress, vibrations, structural integration and engine integrity (including aeroelasticity and flutter) 	<ul style="list-style-type: none"> – Essais de givrage pour moteurs d'avions – Technologie des joints dans les turbo-moteurs – Contraintes, vibrations, intégrité de la structure et du moteur (y compris l'aéroelasticité et flottement)

*Titles of Meetings**Titres des Réunions***Structures & Materials Panel**

- Characterization of low cycle high temperature fatigue by the strain-range partitioning method
- Advanced fabrication processes
- Caractérisation par la méthode du morcellement des gammes de contraintes, de la fatigue produite par les températures élevées à de faibles cycles
- Procédés avancés de fabrication

Technical Information Panel

- Information and industry
- l'information et l'industrie

Lecture Series

- Three dimensional and unsteady separation at high Reynolds numbers
- The application of inexpensive minicomputers to information work
- Radio and optical propagation for modern communications, navigation and detection systems
- Strap-down inertial systems
- Fracture mechanics design methodology
- Energy conservation in aircraft propulsion
- Décollements tridimensionnels et instables aux Nombres de Reynolds élevés
- Utilisation de mini-ordinateurs peu coûteux pour les travaux d'informatique
- Propagation radio et optique pour les systèmes modernes de communications, de navigation et de détection
- Systèmes inertIELS liés
- Méthodes conceptuelles tenant compte de la mécanique des ruptures
- La conservation de l'énergie dans les systèmes propulsifs aéronautiques

Aerospace Application Studies Committee

- AASC Meeting and Working Groups
- Réunion AASC et groupes de travail

Headquarters

- AGARD Annual Meeting
- National Delegates Board Meeting
- Steering Committee Meeting
- Panel Chairmen Meeting
- National Co-ordinators Meeting
- Réunion Annuelle de l'AGARD
- Réunion du Conseil des Délégués Nationaux
- Réunion du Comité d'Orientation
- Réunion des Présidents de Panels
- Réunion des Coordonnateurs Nationaux

II – PROGRAM DESCRIPTIONS

PANELS

CONSULTANT & EXCHANGE PROGRAM

- INDIVIDUAL CONSULTANTS
- LECTURE SERIES

MILITARY COMMITTEE STUDIES

HEADQUARTERS

AEROSPACE MEDICAL PANEL

Chairman: Médecin Général G.PERDRIEL, FAF, France
Deputy Chairman: Air Commodore J.N.C.COKE, RAF, UK
Executive: Lt Colonel F.MONESI, IAF

PROGRAM

In 1978 the Panel will cover four specialists topics in the course of its Spring and Fall meetings.

The Spring Meeting will concentrate on the problems of operational helicopter medicine, with three main topics covering clinical and operational experience and future plans; biodynamic stresses in helicopter operations; and human factors in helicopter operations.

In recent years the need for optimized test procedures using a variety of subjects for the evaluation of crash safety has been further intensified. The first session of the Fall Meeting, entitled 'Human Biodynamic Response and Use of Analogues and Models for Evaluation of Escape/Crash Injury and Protection' will cover the latest state-of-the-art and make definitive recommendations to the protective systems design community on analogues and models. The second session will consider the 'Human Factor Aspects of Aircraft Accidents and Incidents'. The techniques for the investigation of aircraft accidents/incidents are becoming more sophisticated, and more attention is being given to the human factors aspects. This session will therefore be devoted to an exchange of techniques and concepts useful for the improvement of air safety. A session on 'Recent Advances in Aeronautical and Space Medicine' takes place every two years. The relevance of aeronautical and space medicine to the AGARD mission will continue to grow in the coming decades and concerns astronauts as well as payload scientists. The third session will thus present the significant advances in the field of aeronautical and space medicine.

In addition, a new Working Group on 'Comparative Study of Neurological and Psychiatric Techniques' will study the application of criteria for flying fitness. The main benefit will be to provide medical examiners, who have no highly specialized skills, with an authoritative guide which would save considerable time in extensive psychiatric exploration and lead to more reliable predictions of performance.

The Panel will publish conference preprints and conference proceedings for the four topics of the specialists' meetings and two AGARDographs, as well as the report of the Working Group on 'Evaluation of Methods to Assess Workload'.

MEETINGS

Specialists' Meeting	– Operational Helicopter Aviation Medicine	1–5 May 1978 United States
35th Panel Meeting/ Specialists' Meetings	– Human Biodynamic Response and use of Analogues and Models for Evaluation of Escape/Crash Injuries and protection – Human Factors Aspects of Aircraft Accidents and Incidents – Recent Advances in Aeronautical and Space Medicine	6–10 November 1978 France

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Operational Helicopter Aviation Medicine Conference Preprints	March 1978
Operational Helicopter Aviation Medicine Conference Proceedings*	August 1978

* Including Technical Evaluation Report

<i>Subject</i>	<i>Projected Publication Date</i>
Human Biodynamic Response and Use of Analogues and Models for Evaluation of Escape/Crash Injuries and Protection Conference Preprints	October 1978
Human Biodynamic Response and Use of Analogues and Models for Evaluation of Escape/Crash Injuries and Protection Conference Proceedings*	1979
Human Factors Aspects of Aircraft Accidents and Incidents Conference Preprints	October 1978
Human Factors Aspects of Aircraft Accidents and Incidents Conference Proceedings*	1979
Recent Advances in Aeronautical and Space Medicine Conference Preprints	October 1978
Recent Advances in Aeronautical and Space Medicine Conference Proceedings*	1979
Human Factors in Air Traffic Control AGARDograph	1978
Mathematical Models of Manned Aerospace Systems AGARDograph	1978
Evaluation of Methods to Assess Workload Advisory Report	1978

* Including Technical Evaluation Report

AVIONICS PANEL

Chairman: Mr J.N.BLOOM, Canada
Deputy Chairman: Ir H.A.TIMMERS, Netherlands
Executive: Cdr. D.G.CARRUTHERS, USN

PROGRAM

The 1978 Avionics Panel program will consist of two symposia and one specialists' meeting.

The Spring Symposium is entitled, 'Digital Communications in Avionics'. This Symposium will examine the results of continued technological advances in digital communications systems and techniques. The entire technology will be examined, including basic concepts, methods of coding and decoding, special devices and terminals, applications of fiber optics to digital multiplex communications in aircraft and test equipment and procedures.

A Fall Specialists' Meeting on 'Strategies for Automatic Track Initiation' is proposed to review the development of computer-aided radar data processing, especially as related to airborne tracking radars. Both theoretical concepts and practical experience with operational systems would be examined. Algorithms for track initiation which consider target and clutter environment; problems of handover from surveillance to tracking radars; techniques to improve the probability of correct track initiation; tracking in clutter and ECM environments; turn/maneuver detection; and clutter mapping would be discussed. Since these topics are oriented toward tactical data processing, the software, structure and controls of computer-aided tracking systems would also be included.

The Fall Symposium is on the subject, 'Data Handling Techniques and Systems'. Technologically complex and sophisticated systems are currently in use which make available to Tactical Commanders amounts of data which must be rapidly assimilated, processed, and displayed or transmitted to permit coordinated, cohesive prosecution of a given task. This technological aspect of modern tactical warfare will be examined during this symposium. The significant advances in solid state computing devices and memories, programming, high order languages and the commensurate growth in information requirements will be considered. The results will provide to the NATO military engineering community a cohesive assessment of the advances and equipments.

MEETINGS

35th Panel Meeting/ Symposium	– Digital Communications in Avionics	5–9 June 1978 Germany
36th Panel Meeting/ Symposium/ Specialists' Meeting	– Data Handling Techniques and Systems – Strategies for Automatic Track Initiation	16–21 October 1978 United States

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Digital Communications in Avionics Conference Preprints	May 1978
Digital Communications in Avionics Conference Proceedings	October 1978
Strategies for Automatic Track Initiation Conference Preprints	October 1978
Strategies for Automatic Track Initiation Conference Proceedings	December 1978

<i>Subject</i>	<i>Projected Publication Date</i>
Data Handling Techniques and Systems Conference Preprints	October 1978
Data Handling Techniques and Systems Conference Proceedings	February 1978
Communications with Low Flying Aircraft Beyond the Horizon Advisory Report	December 1978

ELECTROMAGNETIC WAVE PROPAGATION PANEL

Chairman: Capitaine de Frégate P.HALLEY, France
Deputy Chairman: Dr H.J.ALBRECHT, Germany
Executive: Cdr. D.G.CARRUTHERS, USN

PROGRAM

The 1978 Electromagnetic Wave Propagation Panel program will consist of two symposia and one Lecture Series.

The Spring Symposium will be entitled 'Operational Modeling of the Aerospace Propagation Environment'. Waves over the entire electromagnetic spectrum are propagated through the atmosphere, ionosphere, and beyond. Current and planned high-performance military and civilian systems operating in the aerospace environment must utilize full knowledge of the propagation environment to perform in an optimum manner. Users of these systems, too, must have continuous knowledge regarding the state, variability, and susceptibility to natural disturbances of the media.

Forecasting techniques must be developed which are based on media models capable of periodic or real time updating of data at specific locations. The modeling and, as a consequence, forecasting can and must be improved significantly through a better understanding of the governing processes of the interrelated parts of the space environment. This symposium will stimulate discussion of techniques to improve media characterization models, bringing together the developers and the users of the models so that they might better understand each others problems.

The Fall Symposium is entitled 'Millimetre and Submillimetre Wave Propagation and Circuits'. Recent progress in radioelectric and optical techniques makes it possible to consider in one symposium both bands of the electromagnetic spectrum, i.e., millimetric (30-300 GHz) and decimillimetric/infrared. The extent to which radio techniques can move toward shorter wavelengths and to which optics can utilize longer wavelengths will be considered during this meeting, examining particularly the physical and technological limits of expansion of the bands of the two spectra. Contributions will postulate the most promising bands of the spectrum for telecommunications and unguided propagation detection on the one hand and for guided, fibre optics or circular waveguide telecommunications on the other. The Avionics Panel has been asked to solicit papers which deal with circuits in these areas of technology to present the total aspect of the problem.

A Lecture Series will be presented on the subject 'Radio and Optical Propagation for Modern Communications, Navigation, and Detection Systems'. This will be a review and summarization of recent Panel Symposia and Specialists' Meetings and will cover the full range of systems as described in the title.

MEETINGS

Symposium	- Operational Modeling of the Aerospace Propagation Environment	24-28 April 1978 Canada
25th Panel Meeting/ Symposium	- Millimetre and Submillimetre Wave Propagation and Circuits	4-8 September 1978 Germany

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Operational Modeling of the Aerospace Propagation Environment Conference Preprints	March 1978
Operational Modeling of the Aerospace Propagation Environment Conference Proceedings	October 1978

<i>Subject</i>	<i>Projected Publication Date</i>
Millimetre and Submillimetre Wave Propagation and Circuits Conference Preprints	August 1978
Millimetre and Submillimetre Wave Propagation and Circuits Conference Proceedings	December 1978

FLIGHT MECHANICS PANEL

Chairman: Dipl. Ing. H.MAX, Germany
Deputy Chairman: M. l'Ingénieur J.F.RENAUDIE, France
Executive: Sqn. Ldr. D.A.STANGROOM, RAF

PROGRAM

In 1978 the Flight Mechanics Panel will hold a Specialists' Meeting and a Symposium.

The Specialists' Meeting will concern 'Piloted Aircraft Environment Simulation Techniques'. As simulators can range from very simple devices, used in research, to very complex systems, such as in advanced airline or complete mission training, then a technical meeting on the general subject of simulation will cover a wide range of topics. As a consequence, the most recent AGARD meetings on this subject have allocated little time to environment simulation techniques. The objectives of this meeting are, therefore, to review and exchange information on the general state-of-the-art and special purpose mission applications of environment simulation techniques. The meeting will address, for ground-based piloted aircraft simulators, the generation of out-of-the-cockpit visual scenes, simulation of motion cues, and modelling of and techniques for generating, atmospheric characteristics which affect both the visual scene and aircraft motions. Emphasis will be placed on qualitative and quantitative assessments of the techniques on simulation fidelity. In the context of this meeting, the term environment simulation applies to the representation of real world phenomena which are independent of the specific aircraft being simulated. The first three sessions will cover the basic aspects of environment simulation including: atmospheric modelling, 'out-of-the-cockpit' visual scenes, and motion and indirect motion cues. The second part of the meeting will cover special mission phases including: the 'up-and-away' mission, low altitude flight, and take-off and landing. The meeting will be concluded with a Round Table Discussion.

The Symposium will concern developments in the design of aircraft stability and control systems. Since the last symposium on this subject, there have been many basic and radical changes in this field and a review of the state-of-the-art is therefore appropriate. As the range of topics related to stability and control is very broad it will be essential, to ensure the necessary depth of treatment, to restrict the subjects addressed to those of major significance. One obvious area of importance is that of the design of Control Configured Vehicles (CCVs), as this has a strong influence on the various aspects of aircraft stability and control. Emphasis will be placed, not on control system design, but on the more fundamental relationships between the use of advanced CCV concepts and sound, basic aerodynamic design. Five sessions are proposed, commencing with a summary of the recent developments, in the various disciplines, and an overview of the current state-of-the-art with particular reference to reliability and cost effectiveness. Session two will cover the use of mathematical models in the design of aircraft with advanced stability and control systems, determination of derivatives and confirmation of results using both simulators and flight tests. It is likely that FDP will participate in this session with an overview from their Spring 1978 Symposium on Dynamic Stability Parameters. Session three will examine the criteria of satisfactory behaviour of aircraft equipped with advanced stability and control systems and session four will investigate the participation of the pilot in completing the control loop, with emphasis on display systems, models of pilot functions and methods for the determination of workload. The final session will be a Round Table Discussion to summarize the main issues raised in the Symposium.

The Panel will be involved in three Working Groups. The first of these is the continuing activity on the 'Estimation of Manoeuvre Boundaries in the Design Phase of Combat Aircraft'. A second Working Group on the 'Dynamic Characteristics of Flight Simulator Motion Systems' will also continue its work throughout 1977. The Panel would also participate in a proposed ASMP Working Group on the 'Fidelity of Simulation'.

In addition, the Flight Test Instrumentation Group will continue to be active in the production of a number of volumes in the eighteen volume series on Flight Test Instrumentation, and will also continue to selectively update the Manual on Flight Test Techniques.

MEETINGS

52nd Panel Meeting/ Specialists' Meeting	– Piloted Aircraft Environment Simulation Techniques	24–28 April 1978 Belgium
53rd Panel Meeting/ Symposium	– Stability and Control	25–29 September 1978 Canada

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Multi-Panel Symposium on Fighter Aircraft Design Conference Proceedings	March 1978
Fighter Aircraft Design Technical Evaluation Report	February 1978
Performance Prediction Methods Conference Proceedings	March 1978
Piloted Aircraft Environment Simulation Techniques Conference Proceedings	November 1978
Flight Test Instrumentation and Test Technique Volumes AGARDographs	1978
Flight Simulator Motion Quality Advisory Report	1979
Estimation of Manoeuvre Boundaries in the Design Phase of Combat Aircraft Advisory Report	1979

FLUID DYNAMICS PANEL

Chairman: Mr J.P.HARTZUIKER, Netherlands
Deputy Chairman: Mr J.L.JONES, US
Executive: Mr M.C.FISCHER

PROGRAM

The Fluid Dynamics Panel 1978 program consists of two Symposia, the sponsoring of a Lecture Series, and the publishing of several AGARDographs and Reports.

The Spring 1978 Symposium is entitled 'Dynamic Stability Parameters' and will center on the determination of needs for dynamic stability information, the form in which it should be presented, and on identifying the best means for obtaining such information.

The modern aircraft is exposed – much more often than in the past – to unsteady flow fields that may have significant effects on its characteristics of motion. The space shuttle and the high performance military aircraft (including CCVs and VLFs) are prime examples of vehicles for which these phenomena are of high interest. The unsteady flow fields involved are usually highly nonlinear and complex and result in stability characteristics that are strong functions of angle of attack and that may represent a significant aerodynamic coupling between the longitudinal and the lateral degrees of motion. A good knowledge of stability characteristics at high angles of attack is essential for a better appreciation of the entire complex of stall/spin problems and may even lead to re-examination of the present formulation of equations of motion.

In the Fall, a Symposium on 'High Angle of Attack Aerodynamics' will be organized. The demand for high manoeuvre capability and hence for high angles of attack both in aircraft and missiles leads to flows with separation and the formation of vortices. These vortices typically have a large influence, both favorable and unfavorable, on vehicle aerodynamic characteristics and an increased understanding is needed of their creation, convection and interaction effects. The meeting will assess and establish improved flow modeling concepts for design purposes. Theoretical and experimental investigations, techniques and procedures will be presented and reviewed.

The Panel will support a Lecture Series on 'Three Dimensional and Unsteady Separation at High Reynolds Numbers' at the Von Kármán Institute. The fluid physics of turbulent flow separation and reattachment remains as one of the basic unknowns to the fluid mechanist and designer today. The most recent experimental results, computational techniques and prediction methods will be discussed.

The Sub-Committee on Windtunnel Testing Techniques will continue to encourage, initiate, and support activities concerning model systems for high Reynolds number windtunnels, test section wall design and interference, aerodynamic noise, and boundary-layer transition.

MEETINGS

42nd Panel Meeting/ – Dynamic Stability Parameters Symposium	29 May–1 June 1978 Greece
43rd Panel Meeting/ – High Angle of Attack Aerodynamics Symposium	2–6 October 1978 Norway

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Unsteady Aerodynamics Technical Evaluation Advisory Report	February 1978
Dynamic Stability Parameters Conference Preprints	May 1978

<i>Subject</i>	<i>Projected Publication Date</i>
Dynamic Stability Parameters Conference Proceedings	September 1978
Dynamic Stability Parameters Technical Evaluation Advisory Report	September 1978
High Angle of Attack Aerodynamics Conference Preprints	September 1978
High Angle of Attack Aerodynamics Conference Proceedings	December 1978
High Angle of Attack Aerodynamics Technical Evaluation Advisory Report	1979
Report of Working Group 04 – Experimental Data Base for Computer Program Assessment Advisory Report	February 1978
Laminar Flow Control Technology AGARDograph	1979
A Commentary on Available Compressible Turbulent Boundary Layer Data AGARDograph	1978
Effects of Strakes on Lifting Surfaces AGARDograph	1978
Towards New Transonic Windtunnels AGARDograph	1978
Dynamic Stability Characteristics AGARDograph	1978

GUIDANCE AND CONTROL PANEL

Chairman: Mr M.A. OSTGAARD, US
Deputy Chairman: Mr P.KANT, Netherlands
Executive: Lt Colonel M.H. CAVENEL, FAF

PROGRAM

The activities of the Guidance and Control Panel will include two Symposia and three AGARDographs. The Panel will also sponsor a Lecture Series. In addition, a new Working Group is being formed.

Rapidly developing technologies in navigation sensors, target identification sensors, command and control and computation capability are structuring a command network that demands increased functional integration of crew station and control configuration to permit effective use of these technologies. The Spring Symposium will thus be devoted to 'The Impact of Integrated Guidance and Control Technology on Weapons System Design'. Aspects to be covered include: operational concepts, needs and technology trends; weapon delivery and flight control integration; communication, command, control and sensor data integration, display concepts and interaction between pilot and system; data processing and distribution systems.

As an effort complementary to the 1976 GCP Meeting on 'Night and All-Weather Guidance and Control Systems for Fixed-Wing Aircraft', the Fall Symposium will be devoted to 'The Guidance and Control of Helicopters and V/STOL Aircraft at Night and in Poor Visibility'. Considering the operational needs and experience in the light of growing technological capability, the conference will discuss current advances in electro-optical and other sensors and their impact on other guidance and control systems in the aircraft. System integration and the man-machine interface are among the aspects to be covered, together with design, performance and capabilities of complete systems for night and low visibility operation.

The panel will also publish an AGARDograph on 'Advances in Inertial Navigation Systems and Components', including alignment and test calibration methods, test methods and life cycle cost analysis of inertial systems.

Information on the detailed principles of the Global Positioning System (GPS) is presently both sparse and scattered; the second AGARDograph will be a text book on the many complex interrelated GPS technical issues including the space-borne segment, the ground based segment and user equipment design details.

A third AGARDograph will address the 'Theory and Application of Optimal Control in Aerospace Systems'.

In addition, the Panel will sponsor a Lecture Series on 'Strapdown Inertial Systems'.

A new Working Group is being formed on 'The Impact of Global Positioning System on Guidance and Control Systems Design of Military Aircraft'.

MEETINGS

26th Panel Meeting/ Symposium (Classified)	– The Impact of Integrated Guidance and Control Technology on Weapons System Design (Classified)	8–12 May 1978 Norway
27th Panel Meeting/ Symposium (Classified)	– The Guidance and Control of Helicopters and V/STOL Aircraft at Night and in Poor Visibility (Classified)	9–13 October 1978 Netherlands

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Guidance and Control Design Considerations for Low Altitude and Terminal Area Flight Technical Evaluation Report	May 1978
The Impact of Integrated Guidance and Control Technology on Weapons Systems Design Conference Proceedings	October 1978
The Impact of Integrated Guidance and Control Technology on Weapons System Design Technical Evaluation Report	December 1978
Advances in Inertial Navigation Systems and Components AGARDograph	October 1978
Principles of the Global Positioning System AGARDograph	August 1978
The Impact of Global Positioning System on Guidance and Control Systems Design of Military Aircraft Advisory Report	May 1979
Theory and Application of Optimal Control in Aerospace Systems AGARDograph	March 1979

PROPULSION AND ENERGETICS PANEL

Chairman: Dr Ing. G.WINTERFELD, Germany
Deputy Chairman: Dr J.DUNHAM, UK
Executive: Dipl. Ing. J.H.KRENGEL

PROGRAM

PEP activities in 1978 will have a broad technical range. Aircraft fire safety will be a highly important subject and will cover matters beyond purely propulsion aspects. Coverage of the field of gas turbine aero engines will emphasize engineering and engine applications. Fundamental research will play an important part in the subject of turbulent transport phenomena, and their particular relation to combustion processes.

Three technical meetings will be held in 1978: two Specialists' Meetings in the Spring, and one Symposium in the Fall.

The first Specialists' Meeting will be on 'Icing Testing for Aircraft Engines'. It will include papers on icing conditions met by helicopters and aircraft, measuring techniques, icing test facilities, experience on icing tests and specifications for engines.

The second Specialists' Meeting on 'Seal Technology in Gas Turbine Engines' will promote the exchange of experience on design, construction, service behaviour and maintenance of seals and their interrelations with bearings used in aero engines.

The Symposium in 1978 will be held on mechanical stresses and vibrations in aircraft engines, and on engine integrity and integration. Applications of analytical methods in the design phase to calculate steady and alternating stresses of turbo-engine components as well as experimental stress analysis will be considered. Particular attention will be given to engine-airframe integration, aeroelasticity and flutter, and rotating stall. Systems for the control of vibrations during engine operation will be included. This Symposium will broaden the activities of the Panel on aero engines. It will provide links with the activities of the Structures and Materials Panel on Flutter, with those of the Fluid Dynamics Panel on Unsteady Aerodynamics, and with the 1975 PEP Symposium on *Unsteady Phenomena in Turbo-machinery*.

A Lecture Series on 'Energy Conservation in Aircraft Propulsion' is proposed to increase the awareness of the aeronautical community of energy conservation problems. The Lecture Series will also contain a survey of different approaches, from the points of view of fuels and of engine technology.

It is planned that the PEP Working Groups both on 'Aircraft Fire Safety' and on 'Turbulent Transport Phenomena' will reach their final phases during 1978, and submit their reports at the end of the year.

MEETINGS

51st Panel Meeting/ Specialists' Meeting	<ul style="list-style-type: none"> – Icing Testing for Aircraft Engines – Seal Technology in Gas Turbine Engines 	3–7 April 1978 United Kingdom
52nd Panel Meeting/ Symposium	<ul style="list-style-type: none"> – Stresses, Vibrations, Structural Integration and Engine Integrity (Including Aeroelasticity and Flutter) 	23–27 October 1978 United States

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Icing Testing for Aircraft Engines Conference Preprints	March 1978
Icing Testing for Aircraft Engines Conference Proceedings	October 1978

<i>Subject</i>	<i>Projected Publication Date</i>
Seal Technology in Gas Turbine Engines Conference Preprints	March 1978
Seal Technology in Gas Turbine Engines Conference Proceedings	October 1978
Stresses, Vibrations, Structural Integration and Engine Integrity Conference Preprints	August 1978
Stresses, Vibrations, Structural Integration and Engine Integrity Conference Proceedings	December 1978
Turbulent Transport Phenomena Advisory Report	December 1978
Aircraft Fire Safety Advisory Report	December 1978

STRUCTURES AND MATERIALS PANEL

Chairman: Mr N.F.HARPUR, UK
Deputy Chairman: Prof. A.DERUYTTERE, Belgium
Executive: Mr J.M.N.WILLIS

PROGRAM

The Spring 1978 Panel Meeting will include a Specialists' Meeting on 'Characterization of Low Cycle High Temperature Fatigue by the Strainrange Partitioning Method'. This will deal with the results of a cooperative program which was instigated from consideration of the fact that many advanced turbine engine materials for military applications are now being used to a very high fraction of their ultimate capabilities, and there is thus a great need for more meaningful high temperature mechanical property tests on these materials and also for improved analytical techniques for the prediction of their service or residual life. One particularly vexing problem has been the difficulty of describing and predicting the behaviour of materials at high temperatures and in real environments, such as creep/fatigue interactions present in low cycle high temperature fatigue of engine components. The Panel is actively attacking this problem with a cooperative testing program aimed at the evaluation of the strainrange partitioning approach to the analysis and prediction of low cycle high temperature fatigue life.

A number of laboratories in several countries are participating in this program, each testing its own materials of interest under its own laboratory conditions to ensure that the results obtained will provide validation for a wide range of aerospace materials and to ensure maximum usefulness to each participating laboratory. The final step in the program will be this Specialists' Meeting which will bring together each of the principal participants to permit sharing of the testing experience, to permit an in-depth evaluation of the strainrange partitioning techniques and to provide the maximum possible exposure of this new approach to LCHTF testing.

During the Fall Panel Meeting a Specialists' Meeting will be held on the subject of 'Advanced Fabrication Processes'. Increasing acquisition and maintenance costs of current aerospace systems are reflected in greater emphasis, within many of the NATO nations, on means of reducing processing costs and improving the quality of manufactured components through improved material/process selection and control. Indeed, there are emerging efforts in many of the NATO nations to bring together the design, materials and mechanics fundamentals underlying materials deformation, metal removal, joining, coating and other related processes. Similarly, new processes are emerging, both within the aerospace processing community and within the more general commercial area, that offer significant opportunities for lower cost, higher quality aerospace components. This meeting will bring some of the more important of these processes to the attention of all of the NATO nations so that they can be more readily exploited, and will also importantly promote a dialogue between the fundamental and engineering disciplines which will expedite the development of low cost advanced fabrication processes.

Two other cooperative testing programs will be under way during 1978. The one on 'The Effect of Hole Quality on Fatigue Life in Mechanically Fastened Joints' will be completed and a report will be published towards the end of the year. The second arose from recommendations following the 1976 Lecture Series on Corrosion in Aircraft, and involves both the retrieval and coordination of existing information on corrosion to be published in Manual form and also a continuing experimental program to extend the scope of knowledge on the subject.

Two AGARDographs will be published in 1978 following upon work completed in the previous year. One will be on 'Fatigue Design of Fighters' and will be a compilation of the latest data relating to fatigue of aircraft structures in a form which will provide a guide for designers on minimizing fatigue-producing characteristics in the design. The second AGARDograph, on 'Impact Damage Tolerance of Structures' will deal with the ability of aerospace structures to withstand the impact of different types of projectiles and is intended to develop improved methods of design to resist impact damage.

Work will continue during 1978 on an AGARDograph on 'Fracture Mechanics Design Methodology' which will be a comprehensive study of the problem of flaw development and crack propagation. Latest methods and techniques for the practical control of fracture will be presented and related to improved aircraft design. The Panel plans also to sponsor a Lecture Series on this subject which will be correlated with the publication.

Further work will be done to extend the very successful Acoustic Fatigue Data Sheets published as an AGARDograph a few years ago.

It is also planned to continue work on further chapters of the Manual on Fatigue.

MEETINGS

46th Panel Meeting/ Specialists' Meeting/ Working Group Sessions	— Characterization of Low Cycle High Temperature Fatigue by the Strainrange Partitioning Method	10–14 April 1978 Denmark
47th Panel Meeting/ Specialists' Meeting/ Working Group Sessions	— Advanced Fabrication Processes	25–29 September 1978 Italy

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Characterization of LCHTF by the Strainrange Partitioning Method Conference Proceedings	July 1978
Characterization of LCHTF by the Strainrange Partitioning Method Advisory Report	December 1978
Advanced Fabrication Processes Conference Proceedings	December 1978
Non-Destructive Inspection Relationships to Aircraft Design and Materials Technical Evaluation Report/Advisory Report	January 1976
Fracture Mechanics Design Methodology AGARDograph	December 1978
Manual on Fatigue, Volume II, Chapter 8 Manual	December 1978
The Effect of Hole Quality on Fatigue Life in Mechanically Fastened Joints Report	October 1978
Structural Design for Damage Tolerance Report	June 1978
Load Monitoring and Fatigue Life Control Report	December 1978
Calculation of Unsteady Aerodynamic Forces Report	December 1978
Ceramic Materials for Limited Life Engine Components Report	December 1978
Corrosion Data Retrieval Report	December 1978
Manual on Corrosion, Volume I Manual	December 1978
Acoustic Fatigue Data Sheets AGARDograph	December 1978

TECHNICAL INFORMATION PANEL

Chairman: Mr H.E.PRYOR, US
Deputy Chairman: Mr A.DISCH, Norway
Executive: Mr J.H.TROTMAN

PROGRAM

The Panel will hold a Specialists' Meeting on 'Information and Industry'. Increasing importance is being given to the exploitation of scientific and technical information developed as a result of defense and aerospace research. It is therefore desirable to review the state-of-the-art in 1978 and to ensure that the results of this study are communicated to industry, and in particular to those who could benefit from the utilization of information resulting from aerospace research and development. Further, the information services play an essential part in technology transfer; the meeting will therefore survey the main facilities in the field of information now available to industry, of which in many cases they are unaware, such as the major data banks (Chemical Abstracts, INSPEC, NASA/RECON, etc.), Information Analysis Centres, interfaces between information Centres and manufacturers (Industrial Liaison Officers) etc., and compare the various methods of Information Transfer. It will also serve to bring together specialists familiar with these problems and industrial managers, in order to draw attention to available facilities for the transfer of aerospace information and technology, and to the need to ensure the dissemination of research information.

The Panel will sponsor a Lecture Series on 'The Application of Inexpensive Mini-Computers to Information Work'.

Work is proceeding in 1977 on the first three chapters of a 'Manual of Documentation Practices Applicable to Defense/Aerospace Scientific and Technical Information', and three further chapters will be undertaken in 1978.

Indexing is a fundamental part of Information Retrieval Systems. Man-intensive low-cost systems are now giving way to computer-assisted indexing and in particular to systems that require the text to be indexed in machine readable form. Recent experience in this field will be reported in an AGARDograph. The national information centres connected to the ESA Space Documentation Service are carrying out an evaluation of Free-Term versus Descriptor retrieval using a two year test file in the NASA database. TIP hopes to publish this Report which will be of interest to all aerospace documentation centres.

Updating of the Multilingual Aeronautical Dictionary will continue throughout 1978, involving editorial work and the provision of new terms and definitions. Work on the 1977-1979 AGARD Index will also continue in 1978.

MEETINGS

**31st Panel Meeting/ — Information and Industry
 Specialists' Meeting**

16-20 October 1978
 France

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Information and Industry Conference Preprints	September 1978
Information and Industry Conference Proceedings	December 1978
A Manual of Documentation Practices Applicable to Defense/Aerospace Scientific and Technical Information. Sections 4, 5 and 6 Manual	December 1978
Semi-Automatic Indexing AGARDograph	June 1978

<i>Subject</i>	<i>Projected Publication Date</i>
Comparative Evaluation of Free-Term versus Descriptor Retrieval using the Aerospace Information Database Report	March 1978
Multilingual Aeronautical Dictionary	
1977-1979 Supplement to the AGARD Index	1980

CONSULTANT AND EXCHANGE PROGRAM

Director, Plans and Programs: Mr R.A.WILLAUME
Deputy Director, Plans and Programs: Mr B.HELLOT

INDIVIDUAL CONSULTANTS

The Consultant and Exchange Program makes available to the NATO Member Nations scientific and technical expertise in the aerospace field. Individual consultants are specifically requested by the National Delegates of the Nations concerned. Individual consultants are also made available to support varied AGARD activities; Panels or Panel Members request individual consultants' expertise, visits and lectures by individuals or by teams of experts for carrying out part of their programs. Panels, Working Groups and the AASC also make use of individual consultants to support specific projects.

LECTURE SERIES

Based upon the suggestions made by the Panels, and the interest shown by the Nations, the Consultant and Exchange Program proposes to implement six Lecture Series during the year 1978. Taking into account the requests of the various nations, 15 locations have been tentatively selected for the presentation of these Lecture Series.

The proposed budget includes the printing of the Lecture Series publications as well as honoraria and incidental expenses, travel and per diem expenses for the participating speakers.

A description of the individual Lecture Series follows.

Lecture Series No.92 (TIP)	THE APPLICATION OF INEXPENSIVE MINICOMPUTERS TO INFORMATION WORK	April 1978 Netherlands/Turkey
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Minicomputers are now extremely powerful and can be equipped with large access stores. These features make them ideally suited to information work and their cost is sufficiently low that an information centre or service can even justify having one solely for its own use. This avoids all the problems inherent in the sharing of a main frame computer, either in an associated organization or at a commercial bureau.

This Lecture Series will outline the ways in which many computers can be used in information work and will include examples of their current use in a number of different areas, such as editing and publishing information bulletins, SDI and retrospective retrieval and library housekeeping.

Lecture Series Director: Mr R.A.McIvor, Director, Defence Scientific Information Services
 Ottawa, Ontario K1A 0K2, Canada

Lecture Series No.93 (EPP)	RECENT ADVANCES IN RADIO AND OPTICAL PROPAGATION FOR MODERN COMMUNICATIONS, NAVIGATION, AND DETECTION SYSTEMS	May 1978 Norway/UK/Italy
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The aim of this Lecture Series is to introduce engineers and system designers to new studies in the field of radio wave and optical propagation. With new requirements of greater data rates in communications, great accuracy in both satellite and low frequency navigation systems and with optical systems of communication and detection being developed, the limits of the medium through which the energy is propagated must be considered.

Ionospheric limitations and tropospheric effects which contribute to radio wave propagation problems will be introduced, as well as the problems of coherent propagation and image reconstruction, incoherent propagation, and remote sensing, in optical systems. Propagation problems associated with modern systems will be investigated, including those relative to laser transmission, such as transmission-radiation difficulties, blooming and LIDAR. Incoherent optical propagation will be discussed, with emphasis on scintillations, absorption, refraction and scattering loss. The effects of atmospheric properties, surface signatures and the sea on infra-red, ultra-violet, and microwave remote sensing will be presented. Radio wave scintillation effects on tracking and methods of communication through the aurora and the equatorial irregularities also will be presented, leading logically into a description of the need for forecasting and prediction of the ionospheric parameters, and discussion of development of techniques to accomplish that prediction.

The Lecture Series will include examination of low frequency radio wave propagation, analyses of LF navigation system errors and problems and new LF systems. The field of range and position error correction in navigation and positioning systems will be discussed and will include radar and navigation correction techniques. HF transmissions will be presented, including backscatter and forward scatter HF radars, developments in ray tracing, and channel selection topics.

The Lecture Series will conclude with techniques applicable to artificial modification of propagation media, with both high power and chemical release methods being presented.

This ambitious Lecture Series will summarize several symposia and specialists meetings, provided expert condensation of the material and describe the need for additional effort as well as the latest progress in the field.

Lecture Series Director: Dr Jules Aarons, Senior Scientist, Air Force Cambridge Research Lab.
Bedford, Mass 01730, USA

Lecture Series No.94 (FDP)	THREE DIMENSIONAL AND UNSTEADY SEPARATION AT HIGH REYNOLDS NUMBERS	February 1978 Brussels (VKI)
<p>This Lecture Series will be devoted to two major aspects of the topic: the physics of flow separation and reattachment, with particular reference to turbulent flows, and a consideration of some practically important types of separated flows which occur in aeronautics. Under both headings lectures will be included on the most recent experimental work, computational techniques and prediction methods, and an attempt made to assess progress and to identify those areas in which further work should be done. Although attention will not be confined to incompressible flows, it is intended that only passing reference should be made to shock-wave boundary layer interaction.</p>		
Lecture Series Director:	Mr M.Sirieix, Directeur Scientifique Adjoint de l'Aérodynamique, ONERA, France	

The state-of-the-art in Strap-Down Inertial Systems Technology has advanced to a state where it seems timely to present it to the NATO Community in the form of a Lecture Series. Until now, this technology has been covered only in many separate papers, and no coherent document covering the whole spectrum of this technology is available.

The Lecture Series will provide an overview of the current technologies being implemented in strap-down navigation, control, and guidance systems. Technology highlighting the up-to-date techniques employed in the development of inertial sensors, analysis, data processing and subsystem integration will be discussed, along with predictions of the directions these techniques are likely to take. This will provide the overall background necessary for understanding the principles and mechanisms of real, current-day, strap-down systems and likely future systems using the newest technology.

Lecture Series Director: Dr G. Schmidt, Technical Director, The Charles Stark Draper Lab. Inc, USA

Lecture Series No.96 ENERGY CONSERVATION IN AIRCRAFT PROPULSION October 1978
(PEP) UK/Germany

The world's petroleum resources are rapidly being depleted. If we continue to consume these resources at our current rate of consumption, the consensus is that the world will essentially run out of fuel by the turn of the century. The need for fuel conservation will be most urgent if not mandatory, because the future of aviation, as we know it today, is at stake.

The Lecture Series will present

- Statement of Problem; increased demand for fuel; decreased supply of fuel; economics of energy conservation and impact on civil and military aircraft operations and on aircraft noise and pollution requirements.
- Future Fuels for Aviation: hydrocarbon fuels outlook; alternate aviation fuels outlook including coal, oil shale, tar sands, methanol, methane, hydrogen.
- Low Energy Consumption Energy: (a) conventional engines: high temperature and pressure turbofans; variable geometry; reliability, durability, maintainability; unconventional cycles; (b) turboprops regenerative turbofans: variable geometry; reliability, durability, maintainability.
- Engine Component Improvements: increased efficiency (all components); improved seals and tip clearance controls.
- Low Energy Conservative Aircraft Designs and Operational Procedures: high aspect ratio wings; integrated aircraft/engine controls; cruise speed and altitude.
- Energy Savings through Broadened Fuel Specifications: reduced energy refining processing; impact of broadened fuel specifications on engine components.
- Summary and Recommendations.

Lecture Series Director: Mr N. Rekos, Acting Deputy Director, Aeronautical Propulsion Div.
Office of Aeronautics and Space Technology, NASA Hqs., Washington D.C. 20546, USA

**Lecture Series No.97
(SMP)**

FRACTURE MECHANICS DESIGN METHODOLOGY

**October 1978
Germany/Netherlands/
Portugal**

This Lecture Series will consist of three major parts: Fracture Mechanics Principles; Damage Tolerance Analysis; and Damage Tolerance Design.

The first part will provide the tools for the second and third and will consist of a general introduction to the subject, followed by presentations on residual strength will review the criteria for slow crack growth and fast fracture, and discuss the use and limitations of fracture toughness data for plane strain as well as plane stress. The session on fatigue-crack propagation will point out proper ways to evaluate and use da/dN data. A discussion will follow on retardation and prediction of crack propagation under actual service loading will be treated.

The second part of the Series will discuss means for a formal stress-intensity analysis of complex structures. Subsequently, techniques for a quick appraisal of stress-intensity factors will be presented. This will set the stage for a treatment of damage-tolerance analysis of actual aircraft components, such as forgings, joints, and stiffened structures. The prediction of residual strength, as well as crack propagation, will be reviewed.

The final part will address the means to achieve damage tolerance. An evaluation will be made of the accuracy of residual strength and crack-growth predictions (from experiments and computations). This problem will be addressed from the points of view of scatter of the material data, unknowns in the load history, and limitations of the analysis. Finally, the application of reasonable safety factors and the use of damage-tolerance requirements will be addressed.

Lecture Series Director: Dr D.Broek, Structural Materials and Tribology Section, Battelle, Columbus Lab.
Ohio 43201, USA

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
The Application of Inexpensive Minicomputers to Information Work Lecture Series No.92	April 1978
Recent Advances in Radio and Optical Propagation for Modern Communication, Navigation and Detection Systems Lecture Series No.93	May 1978
Three-Dimensional and Unsteady Separation at High Reynolds Numbers Lecture Series No.94	February 1978
Strap-Down Inertial Systems Lecture Series No.95	June 1978
Energy Conservation in Aircraft Propulsion Lecture Series No.96	October 1978
Fracture Mechanics Design Methodology Lecture Series No.97	October 1978

MILITARY COMMITTEE STUDIES

AEROSPACE APPLICATIONS STUDIES COMMITTEE

Chairman: Mr J-C.WANNER, France

MILITARY COMMITTEE STUDIES DIVISION

Chief: Colonel G.H.DIMON, USAF
Deputy for Systems Analysis: Colonel G.BRON, FAF
Deputy for Research and Development: Mr J.WILD

PROGRAM

One Aerospace Applications Study, submitted by the North Atlantic Military Committee and conducted under the auspices of the Aerospace Applications Studies Committee, will be completed and published during 1978. This study will be on "Suppression of Detection and Guidance Systems other than Radar, Associated with SAMs and ASM/Guided Bombs" (AAS No.11).

There is also a follow-on study to AAS No.9 in the form of two AGARDographs before the overall defence concept, conceived by the AAS No.9 Working Group, will be explored further. These two AGARDographs will be published in late 1978.

The Military Committee Studies Division has also been engaged in an initial effort that responds to a Military Committee request to perform an "Evaluation of Prospective Major Technological Developments in Aerospace up to the Year 2000 and their Impact on Possible Military Applications (Forecast of the Future Technological Threat)" commonly called "Project 2000". If the NDB and the NATO Military Committee decide that a Project 2000 Phase Two should be started in Autumn 1977, the AGARD Military Committee Studies Division should be ready to support this exercise, which could result in a set of Advisory Reports produced by ad hoc Working Groups.

If Phase Two of Project 2000 is not pursued, Aerospace Applications Study No.12 "Possibilities for Achieving Accurate ASM Delivery from High Altitude and for Long Range" will be initiated in Autumn 1977 and published in April 1979. Work will continue through 1978.

Two additional Aerospace Applications Studies would then be initiated in 1978 (AAS Nos 13 and 14). One topic to be covered would be selected at the September 1977 NDB Meeting for AAS No.13 and at the March 1978 NDB Meeting for AAS No.14, both originating in a request for studies from the North Atlantic Military Committee.

Technology Studies are conducted in support of the North Atlantic Military Committee by Ad Hoc Study Groups sponsored by the appropriate Panels. The budgetary information and schedules for these studies are included in the Panel programs.

MEETINGS

AASC Meeting No.15 – Final Report – AAS No.12
 (Classified) Mid Term Review – AAS No.13
 Define Terms of Reference – AAS No. 14 and 15
 Organize Working Group No.14

15–24 May 1978
 United States

AASC Meeting No.16 – Final Report – AAS No.13
 (Classified) Mid Term Review – AAS No.14
 Organize Working Group No.15

6–15 November 1978
 Belgium

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
Suppression of Detection and Guidance Systems, Other than Radar, Associated with SAMs and ASM/Guided Bombs AAS No.11 Advisory Report (Classified)	April 1978
Follow-on to AAS No.9 (two AGARDographs)	November 1978

HEADQUARTERS
OFFICE OF THE DIRECTOR

MEETINGS

44th NATIONAL DELEGATES BOARD MEETING	15-17 March 1978
25th STEERING COMMITTEE MEETING	France, Paris
24th PANEL CHARMEN MEETING	
8th NATIONAL COORDINATORS MEETING	
14th AGARD ANNUAL MEETING	18-20 September 1978
45th NATIONAL DELEGATES BOARD MEETING	Portugal, Lisbon
25th PANEL CHARMEN MEETING	

PUBLICATIONS

<i>Subject</i>	<i>Projected Publication Date</i>
National Delegates Board Meeting	
Preprints	March 1978
Bulletin 78/2	July 1978
Director's Annual Report to North Atlantic Military Committee 1977	March 1978
1978 Annual Meeting Report	December 1978
AGARD Highlights 78/2	Fall 1978
79/1	Spring 1979

III – BUDGET SUMMARY

1978 TECHNICAL PROGRAM

(IN FRENCH FRANCS)

Panels	1976 Commitments	1977 MBC Approved	1978 Proposed
ASMP	250.600	246.000	251.000
AVP	126.800	107.000	199.000
EPP	73.700	122.000	126.000
FMP	176.600	174.000	240.000
FDP	257.400	273.000	272.000
GCP	269.000	238.000	164.000
PEP	212.300	201.000	209.000
SMP	112.600	325.000	300.000
TIP	101.000	104.000	73.000
SUB-TOTAL – PANELS		<u>1.580.000</u>	<u>1.790.000</u>
			<u>1.834.000</u>
INDIVIDUAL CONSULTANTS	288.000	344.000	345.000
LECTURE SERIES	510.200	607.000	620.000
MILITARY COMMITTEE STUDIES	26.000	190.000	120.000
HEADQUARTERS	38.300	45.000	44.000
OTHER COSTS (Certificates, Layout Sheets, Forms, Meeting Announcements, Distribution, Internal Reproduction, Technical Translation, etc.)	263.800	260.200	270.000
TOTAL – NORMAL AGARD TECHNICAL PROGRAM		<u>2.706.300</u>	<u>3.236.200</u>
			<u>3.233.000</u>
P 2000 PHASE I	164.700	106.000	–
MAD	236.900	194.200	–
SUB-TOTAL		<u>401.600</u>	<u>300.000</u>
<u>TOTAL – INCLUDING ABOVE SPECIAL TASKS</u>		<u>3.107.900</u>	<u>3.536.400⁽¹⁾</u>
			<u>3.233.000⁽²⁾</u>

(1) Average price for 1977

(2) Average price for 1978

IV - 1978 PUBLICATIONS SUMMARY

Activity	Reports	Advisory Reports	AGARDograph	Conference Preprints	Conference Proceedings	Misc.	Total
ASMP	—	1	2	4	4	—	11
AVP	—	1	—	3	3	—	7
EPP	—	—	—	2	2	—	4
FMP	—	3	1	—	3	—	7
FDP	—	4	5	2	2	—	13
GCP	—	3	3	—	1	—	7
PEP	—	2	—	3	3	—	8
SMP	6	2	2	—	2	2	14
TIP	1	—	1	1	1	3	7
DPP	—	—	—	—	—	6	6
MCS	—	3	—	—	—	—	3
HQS	—	—	—	—	—	6	6
TOTALS	7	16	12	15	21	17	93

GRAND TOTAL: 93